

***Indiana Department of Natural Resources
Division of Fish and Wildlife***

LAKE AND RIVER ENHANCEMENT (LARE) PROGRAM

**COMPONENTS OF BIOLOGICAL AND ENGINEERING STUDIES
OR PROJECTS ELIGIBLE FOR FUNDING**

July 2007

List of study or project types:

- 1) Lake or Watershed Diagnostic Study
- 2) Lake or Stream Strategic Management Plan
- 3) Preliminary Engineering Feasibility Study
- 4) Engineering Design Study
- 5) Construction
- 6) Construction Performance Appraisal
- 7) Project Summary for Watershed Land Treatment
- 8) Stream Monitoring (component of several modules)

1. Lake or Watershed Diagnostic Study (for detailed analysis of individual lakes)

Goals:

- Describe condition and trends in lake watershed or stream and subwatersheds
- Identify potential problems - long term resolution (5-10 yrs)
- Identify specific direction for future work
- Predict and assess success factors for future work

Contents (lake and watershed studies listed separately):

A. Lake Diagnostic Study

- IDEM Eutrophication Index (EI) (trends and current)
- Carlson's TSI (algae, total phosphorus, turbidity)
- Water chemistry in lake and tributaries (vertical profile, nutrients, sediment)
- Volunteer monitoring data
- Hydrologic budget (sources, turnover)
- Depth contours (map, depth to volume curve, area to volume curve)
- Plankton surveys (species and abundance)
- Aquatic plant distribution map
- Fish surveys, trends, and management recommendations from DFW
- Waterfowl count
- Shoreline protection map (seawalls, erosion zones, erosion causes)

- Significant natural areas or listed species
- Highly Erodible Land map
- Wetland / hydric soils map
- Land use data (lake and watershed size, number of homes, development history)
- Boating use survey (weekday and weekend count)
- Annotated bibliography of all previous studies
- Potential nonpoint sources and hot spots (general, not individual properties)
- Subwatershed land use maps (agriculture, forest, urban, wetland)
- Vollenweider nutrient loading figure
- Subwatershed modeling (relative nonpoint source contributions)
- Comparison of water quality with similar regional lakes
- Public information "fact sheet" or brochure
- Public information meeting
- Unbound photo-ready copy of report
- Digital copy with figures

B. Watershed Diagnostic Study

- Water chemistry in stream mainstem and tributaries (nutrients, sediment)
- Volunteer monitoring data
- Macroinvertebrate surveys for biological monitoring
- Fish surveys, trends, and management recommendations from DFW
- Bank protection map (armoring, erosion zones, erosion causes)
- Habitat assessment (QHEI)
- Significant natural areas or listed species
- Comparison of water quality with similar regional rivers
- Highly Erodible Land map
- Wetland / hydric soils map
- Land use data (river and watershed size, number of homes, development history)
- Recreational use survey (canoeing, fishing)
- Annotated bibliography of all previous studies
- Potential nonpoint sources and hot spots (general, not individual properties)
- Subwatershed land use maps (agriculture, forest, urban, wetland) - digitized
- Subwatershed modeling (relative nonpoint source contributions)
- Site and landowner inventory
- Wetland functional assessment and conservation opportunities
- Institutional assessment
- Coordinated Resource Management (CRM) recommendations · Volunteer monitoring groups identified or recommended
- Watershed management and leadership resource inventory
- Prioritize project areas
- Cost estimates and timeline
- Public information "fact sheet" or brochure
- Public information meeting
- Unbound photo-ready copy of report
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2. Lake or Stream Strategic Management Plan

Goals:

- Long term guidance to protect and restore system

Contents:

- Update water quality or biological data, as necessary
- Wetland functional assessment and conservation opportunities
- Waterfowl management plan
- Aquatic plant management
- Shoreline protection guidelines
- Lawn care guidelines
- Boating or recreational use restriction zones
- Public access recommendations
- Dam operation
- Water withdrawals
- Lake restoration measures with cost estimates
- Research recommendations (data gaps)
- Institutional assessment
- Identify stakeholders
- Volunteer monitoring groups identified or recommended
- Relationship between local entities (mutual knowledge of goals and abilities)
- Coordinated Resource Management (CRM) recommendations · Lake leader training and resource inventory
- Funding and cost-share ability of local entities
- Education program suggestions and list of resources
- Current regulations and ordinances
- Model ordinances for wetlands or erosion control
- Zoning for conservation and development (land use planning)
- Enforcement assessment and options
- Management responsibilities
- Process for updating plan
- Public information "fact sheet" or brochure
- Public information meeting
- Unbound photo-ready copy of report
- Digital copy with figures

3. Preliminary Engineering Feasibility Study

Goals:

- Determine feasibility of anticipated construction projects
- Prepare for physical design
- Ensure project success

Contents:

- Sediment Chemistry/Core/Toxicity
- Deposition map
- Potential construction sites
- Preliminary engineering assessments/calculations
- Early coordination for permits (USACE, IDEM, USFWS, IDNR, County Drainage Boards)
- Public Meetings
- Public information handout
- Conceptual drawings
- Preliminary cost estimates/timelines
- Easements/land availability
- Unusual costs (physical and/or social)
- Functionality or impact to lake
- Wetland functional assessment (vegetation survey)
- Flood stage analysis
- Rapid Bioassessment Protocol (inverts/fish) downstream of proposed site/s
- Funding sources including local entities ability to fund
- Justification for location or access/environmental tradeoff
- Environmental impact assessment - pre vs. post project (wetlands, water quality, flooding)
- Update any outdated parameters and address information gaps

4. Engineering Design Study**Goal:**

- Prepare for project construction

Contents:

- Complete structural design as directed by Preliminary Engineering and Feasibility Study
- Obtain all necessary environmental permits
- Complete design specifications, contract and bid documents
- Determine bidding assistance, construction, construction engineering and project inspection cost estimates
- Outline methods and measures for post construction structural monitoring

5. Construction**Goal:**

- Project construction

Contents:

- Pre-bid meeting
- Project bid
- Pre-construction meeting
- Construction engineering
- Construction as specified by design study
- Post-construction meeting

6. Construction Performance Appraisal**Goals:**

- Detect water quality changes due to project
- Determine rate of sedimentation
- Identify and repair structural failures and unsuccessful plantings · Establish guidelines for future projects

Contents:

- Determine eutrophic index
- Chemical profile (dissolved oxygen, temperature)
- Plankton species and abundance
- Carlson's TSI
- Instream (above & below construction) baseflow and stormflow sediment and nutrient measurement
- Contact volunteer monitors
- Public information document and report
- Wetland vegetation survey
- Rapid Bioassessment Protocol (inverts/fish) downstream of project site
- Flood stage analysis
- Planting success (species, location, timing)
- Structural failure
- Maintenance schedule (dredging) re-evaluation

7. Project Summary for Watershed Land Treatment**Goals:**

- Demonstrate reasons for success and failure
- Provide direction beyond the project
- Identify water quality changes

Contents:

- Conduct post-treatment biological and habitat assessment

- Compare pre- and post-monitoring data for streams
- Update land use maps
- Compare change in land use
- Determine cost / benefit ratio of the project
- Inventory of project (number of waterways, CRP acreage, etc.)
- Record contact information for land owners and institutions involved
- Institutional recommendations
- Volunteer monitoring assessment and recommendations
- CRM recommendations (coalition building, media)
- Education programs and recommendations
- Critical analysis of project success and failure
- Reasons why any areas were not addressed (social or physical factors)
- Recommend long term follow up and management

8. Stream Monitoring (component of other modules)

Goals:

- Evaluate water quality condition
- Identify potential impacts
- Determine appropriate biological endpoints

Contents:

- Coordinate with SWCD and volunteer monitoring groups
- Selection of sampling sites and reference stream
- Site location maps
- Stream reach maps
- Photographs of site
- Historical data (fish, mussels, IDEM sampling, Heritage Trust data)
- Macroinvertebrate Rapid Biomonitoring Protocol II or III
- Mussel or wildlife observations
- Voucher unusual specimens
- Chemical analysis (dissolved oxygen, conductivity, turbidity, temperature)
- Habitat assessment (QHEI) and geomorphology
- Analysis of indicator species or guilds
- Regression of habitat against biological condition
- Identify potential nonpoint impacts
- Potential constraints for project (soils, topography, point sources)

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